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Producing annual ryegrasses for pasture, silage and seed

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Summary of production guidelines

- Select weed-free, well-drained fields.
- Test the soil.
- Apply lime if needed (annual ryegrass grows best at soil pH of 6.0 or greater).
- Apply phosphate and potash as per soil test results (manure is a good source of nutrients).
- Prepare seed bed so that it is level, fine, and firm.
- Ryegrass is also suitable for minimum tillage planting.
- Choose a cultivar
  - Italian ryegrasses are leafy and suitable for pasture and green manure (plowdown).
  - Westerwolds ryegrasses are suitable for cutting and can be grazed later in the season. They are also used for plowdown in row crop rotations.
- Plant early (by the end of May) to maximize yields, seed diploid varieties at 20-25 kg/ha and tetraploid varieties at 25-35 kg/ha.
- Control weeds by mowing or with herbicides where necessary.
- Start grazing or cutting about 6-8 weeks after seeding.
- Apply nitrogen during the growing season
- Graze until late fall; feed some fiber such as dry hay to animals grazing ryegrass.

Introduction

Italian ryegrass (*Lolium multiflorum)* is a biennial from northern Italy where it was grown as a cultivated species in winter-irrigated meadows in the 13th century. Westerwolds ryegrass is an annual that was developed from Italian ryegrass in the Netherlands in the early part of this century by selecting plants that produced seed in the year of sowing. Italian and Westerwolds ryegrasses are well adapted to conditions in the Atlantic Provinces, where they are usually grown as summer annuals, although some Italian ryegrasses overwinter under favorable conditions.

In this publication Italian and Westerwolds ryegrasses are called collectively annual ryegrasses. The two annual ryegrasses differ considerably in their growth habit. Italian ryegrasses are leafy and tiller readily, which makes them suitable for pasture and green manure. Westerwolds ryegrasses grow stemmy and upright; they range in height from 40 to 80 cm and may be grown for cutting, grazing and green manure.

The chief users of annual ryegrasses are livestock farmers who find them suitable for supplemental pasture and cutting from mid summer to late fall. Annual ryegrasses, included in rotations with crops such as potatoes or corn, maintain soil organic matter, improve soil structure, reduce soil erosion, and enhance crop health. This publication describes annual ryegrasses and their performance, management, and uses in cool, temperate regions such as Atlantic Canada.

Role of annual ryegrasses

Annual ryegrasses grow well on a variety of soils and may be included in various rotations. In contrast to perennial forages, the dry matter production of annual ryegrasses peaks in late summer thus increasing available pasture and providing quality feed for grazing livestock.

Dairy farmers, in particular, find annual ryegrasses useful from July onward. They are able to maintain satisfactory levels of milk production with the help of ryegrass pasture. On beef and sheep farms, producers use annual ryegrasses for grazing animals having a high nutrient requirement such as young, growing stock. When supplemented with perennial forages, annual ryegrasses extend the grazing season beyond its normal range. Having high-quality supplemental forage for a longer season increases animal returns and lowers storage costs. Farmers can also make better use of land and equipment.

Plant description

Italian and Westerwolds ryegrasses are diploids (2n = 14), but tetraploids may be readily produced. The seed of annual ryegrasses is oblong and 5-8 mm long. The 1000 seed weights range from 2 to 5 g, with tetraploids having larger seed size. Hectolitre weight of seed ranges from 36 to 43 kg.

Italian ryegrasses, when grown as summer annuals, remain at a vegetative stage; leaves make up to 60-80% of the whole crop. Westerwolds ryegrasses produce variable numbers of seed-bearing tillers and have a leaf content of 40-60%. The dry matter content of annual ryegrasses ranges from 10 to 20%, depending on cultivar, maturity, and season. The dry matter content of diploids is about two percentage units greater than that of tetraploids.

Cultivars

A number of cultivars have performed well in the Atlantic Provinces regional variety evaluation trials . See "Forage Guide to Variety Selection", Publication 100A, Agdex 100.32 for current list of cultivars http://www.gov.pe.ca/af/agweb/library/production_guides.php3 .The use of certified seed of recommended cultivars guarantees that the seed is true to cultivar, clean, and free of primary noxious weeds. Use of certified seed also guarantees that the cultivar chosen suits the intended purpose. Nonpedigree seed can be of inferior quality, contain weed seed and provides no guarantee as to the type and productivity of ryegrass.

Methods of establishment

Conventional seeding

For high yields, annual ryegrasses must be sown in a firm, fine, and level seedbed as early as possible in the spring. Rolling the field prior to seeding is recommended to firm the seedbed after cultivation. Seeding rates of 20-25 kg/ha for diploids and 25-35 kg/ha for tetraploids are adequate for good stands. Use the heavier rates given for broadcast sowing. Monitor the rate of seeding carefully, because the flow rate of seed varies considerably depending on the cultivar and the type of seeder used. Seed shallow at a depth of about 1 cm, and, to ensure good germination, cover the seed and firm the soil after seeding. Cultipacker seeders and grain drills do a satisfactory job of seeding ryegrasses. Broadcast seeding works well, but light chain harrowing and rolling after seeding are necessary.

Reduced tillage

If annual ryegrasses are grown in the same field in two or more consecutive years, use reduced tillage after the 1st year. Because annual ryegrasses are usually winterkilled, cultivate only lightly to remove dead matter and prepare the seedbed. No-till drills are excellent for seeding in such fields. Grain drills do a satisfactory job; direct the seed through the discs and adjust the tension on discs to obtain a seeding depth of about 1 cm. Broadcast seeding is not dependable under reduced cultivation unless good seed coverage is

obtained.

Use reduced tillage also to seed annual ryegrasses either into grain stubble or following row crops such as potatoes. Competition from established grasses, such as quackgrass (couch), and broadleaf weeds can be a problem with reduced tillage seedings. Control weeds as outlined in the next section.

The yields with both conventional and reduced tillage are usually equal but reduced tillage seeding is considerably faster. The cost of establishing ryegrass with reduced tillage is lower than with conventional seeding. For details on no-till seeding, see "Reduced Tillage Renovation of Pastures and Hay Fields", Factsheet 93-37, Agdex 131.22, Crops and Livestock Research Centre, AAFC http://res2.agr.gc.ca/charlottetown/.

Weed control

Many broadleaf weeds can suppress the seedling growth of annual ryegrasses. Control such weeds by timely defoliation or by spraying with herbicides (Table 1). The following herbicides are suitable for broadleaf weed control in annual ryegrasses

Table 1. Herbicides and rates of application for controlling broadleaf weeds in annual ryegrass

Herbicide	Active ingredient (kg/ha)
2,4-D amine	up to 0.84
MCPA amine	up to 0.84
MCPA sodium	up to 1.26

In some instances, a cereal grain crop sown at low rate (50-75 kg/ha) reduces weeds and increases dry matter yields in the first harvest. To minimize competition on ryegrass, cut or graze cereal-ryegrass mixtures at the vegetative to early dough stage of the cereal crop. Weeds are not usually a problem after the first cutting because ryegrass grows vigorously. With reduced tillage, it may be necessary to suppress quackgrass (couch) and other weeds with preplant applications of glyphosate.

Fertilization

Adequate soil fertility is the key to producing annual ryegrasses. A soil test will specify the type and amount of fertilizer required. Annual ryegrasses grow best when the soil pH is at least 6. Growth is also satisfactory at lower soil pH when it is not desirable to maintain high soil pH (e.g., potato rotation). Farmyard manure worked into the seedbed before seeding is a good source of nutrients for annual ryegrasses.

A small application of nitrogen at seeding is usually necessary (Table 2). Apply more nitrogen (34-0-0 at 100 kg/ha) at the tillering stage in early summer to boost the growth. Apply additional nitrogen (Table 2) as necessary for vigorous growth and good quality until late fall. For pasture, smaller but more frequent applications of nitrogen result in a uniform pasture availability and lower nitrate content in forage.

Regular applications of nitrogen throughout the growing season are essential for the good growth of annual ryegrasses. The required amounts depend on factors such as the rate of application of barnyard manure at seeding and intended use. Fertilizer rates adjusted for applied manure are available as a part of soil testing program.

Table 2. Nitrogen fertilization of annual ryegrasses.

Time	Rate, kg nitrogen/ha		
	Pasture	Conserved forage	Seed
At seeding	35-50	35-50	50
At start of tillering	35-50	35-50	40
After first defoliation	50-65	65-80	
After subsequent defoliations [y]	35-50	50-65	
After seed harvest			50-65

[z] If annual ryegrasses are grown with clovers (50% or greater), reduce the nitrogen rates by 50%
[y] Last application in early September. Apply other nutrients per soil test.

Annual ryegrass mixtures

Annual ryegrasses may be grown in mixtures with forage legumes such as red clover, Persian clover and Berseem clover to reduce the costs of using nitrogen fertilizer. In Charlottetown the yields of legume-ryegrass mixtures without any nitrogen fertilizer were up to 84% of those obtained with nitrogen-treated ryegrass. Seeding rate of annual ryegrass in a mixture should not exceed 10-12 kg/ha for diploids and 15-20 kg/ha for tetraploids; seed red clover at 8-10 kg/ha, Persian clover at 3-6 kg/ha and Berseem clover 5-10 kg/ha. Grow legume-annual ryegrass mixtures on fields with low weed infestation, because weed control may be difficult in such mixtures. An application of ammonium nitrate at 100 kg/ha (33 kg N/ha) after emergence is usually required for good growth. Additional nitrogen fertilizer may be required to maintain production during the growing season.

Seeding Westerwolds ryegrass with a cereal crop can boost yields in the first harvest. Barley should be sown at 50-75 kg/ha and ryegrass at 10-15 kg/ha (diploid) or 18-25 kg/ha (tetraploid).

Use for pasture

Annual ryegrasses are ready for grazing 6-8 weeks after seeding. Accordingly, Italian ryegrasses seeded in early May are ready for grazing by late June or early July. Ryegrasses maintain high daily dry matter production and good quality in late summer and early fall, thus providing good pasture during the period when perennial species are unproductive. Annual ryegrasses require a regrowth period of 2-4 weeks after grazing.

Rotational grazing of ryegrass allows efficient use of pasture. Divide the field into several paddocks, which are grazed one at a time according to the farm's pasture plan. It is preferable to have several small paddocks and graze them in 1 or 2 days. This practice reduces waste from ungrazed patches and soiling of grass, which usually occurs on larger paddocks. The grazing cycle is about two weeks in midsummer but becomes longer as the season progresses and growth of grass slows.

In continuous grazing, check closely the amount of herbage available. Allow the grazing height of grass for dairy to be at least 8 cm in summer and 10 cm in late season to ensure and adequate supply of ryegrass. For beef cattle, maintain the grazing height at 6-8 cm and for sheep at 5 cm or higher.

The area of ryegrass pasture required depends on the availability of permanent pasture, supplementary feeding, amount of concentrates fed, level of milk production, weather, and so on. For the best cattle performance, do not allow the average stubble height to be grazed below 8-10 cm. Grazing below this height causes grass intake to be restricted. As a general guideline, daily herbage allowance should be

about 15 kg dry matter for dairy cows and 8 kg dry matter for beef cattle.

Annual ryegrasses are highly digestible and low in dry matter. With adequate nitrogen fertilization they are also high in crude protein. Avoid heavy applications of nitrogen fertilizer (Table 2) and manure (i.e., nitrogen at more than 80 kg/ha/application) because nitrates in young ryegrass plants may reach dangerously high levels. In general, the nitrate concentration of grass to be grazed by cows should be less than 2.0% in dry matter. For cattle grazing succulent ryegrass, provide access to some hay or roughage. Roughage enables the rumen to function well and helps to maintain adequate butterfat levels in milk.

Table 3. Yields and quality of Lemtal Italian ryegrass under grazing

			Dry Matter		
Time of grazing	Dry matter yield (kg/ha)	Daily dry matter production (kg/ha)	Crude protein (%)	Digestibility (%)	Nitrate (%)
35986	1375	46	19	82	0.4
35999	931	72	31	77	2.9
36018	1556	82	21	77	1.2
36042	1442	60	21	79	0.8
36067	982	39	26	78	1.6
36105	1137	30	25	77	0.7

Note: Trial seeded on 26 May; fertilized at seeding with 17-17-17 at 450 kg/ha and on July 14 and August 13 with 200 kg/ha of ammonium nitrate (66 kg N/ha). Data from Crops and Livestock Research Centre, Charlottetown.

Silage and hay

Westerwolds ryegrasses are more suitable for ensiling than are low-growing, leafy Italian ryegrasses. Most Westerwolds ryegrass cultivars are erect and produce numerous stems thus making Westerwolds ryegrasses suitable for cutting. Harvest Westerwolds ryegrasses at the early heading stage for optimum yield and quality. Cut Italian ryegrasses at the early heading stage for optimum yield and quality. Cut Italian ryegrasses before the bottom leaves start dying. Because annual ryegrasses may accumulate high nitrate concentrations, avoid excessive nitrogen applications. If manure is applied, adjust rates of nitrogen fertilizer to take into account nitrogen available from manure. Hay or haylage containing more than 0.8% nitrate in the dry matter may be toxic to livestock.

Rotary mower-conditioners are well suited to cutting both Italian and Westerwolds ryegrasses as they handle wet and leafy material without plugging. Sickle bar mower-conditioners, when well maintained and adjusted properly, will also do a satisfactory job of cutting, particularly the coarser Westerwolds ryegrasses.

The low dry-matter content of annual ryegrasses may make them difficult crops to conserve. Wilting harvested grass to 35-50% dry matter improves ensiling properties of annual ryegrasses and eliminates seepage from the silo. Field curing of hay may be difficult, particularly under humid conditions and in late season. Spoilage occurs readily unless low moisture content in hay is attained. To assure safe storage, use barn driers to cure ryegrass.

Cover crops and soil improvement

Ryegrasses are grown increasingly in rotations with potatoes and other crops to maintain a soil's

content of organic matter, to improve its structure, and to reduce erosion. Ryegrasses help to alleviate problems associated with intensified row-crop farming and shorter rotation periods. The best time to seed ryegrasses as cover crops is in the spring. Ryegrasses can be seeded until mid-August for erosion control, but successful establishment may be hampered by lack of moisture after seeding. Ryegrasses sown after early September have insufficient time for a good establishment and root biomass will be low.

Italian ryegrasses and the leafy Westerwolds ryegrasses such as Promenade produce a large root mass, which averages 5 t/ha of dry matter in the seeding year. Aubade, Barspectra, and Marshall Westerwolds ryegrasses produce more than 3 t/ha, a root mass similar to that of red clover and alfalfa. The large, fibrous root mass of annual ryegrasses adds organic matter to the soil, which binds soil together and provides good soil structure. Greater levels of organic matter not only improve the soil's water-holding capacity, water infiltration, and level of water-stable aggregates but also increase the soil's resistance to compaction and erosion. In continuous cultivation, Italian ryegrass resulted in soil organic matter of 3.6% as compared with 3.0% for spring wheat and soybeans over a 4-year period.

Growing annual ryegrasses in rotations has other beneficial effects. Annual ryegrasses are poor hosts for the root lesion nematode and are non-hosts for the clover cyst and northern root-knot nematodes, so growing the ryegrasses in rotations may alleviate these pest problems.

Underseeding

Cereal crops such as barley may be undersown with annual ryegrasses to provide ground cover, green manure for soil organic matter, or pasture in late summer and fall. Italian ryegrasses are low growing and therefore remain below combine cutting height in a standing cereal crop. Westerwolds ryegrasses may interfere with combining because they reach a height similar to cereals. It is important that cereal crops develop uniform stands and grow vigorously to avoid excessive competition from ryegrass. For annual ryegrass grown with cereal crops, sow diploid varieties at about 10-12 kg/ha and tetraploids at 15-20 kg/ha. Early grain harvest leaves sufficient time for ryegrass to produce heavy growth for grazing or plowing under. Applying ammonium nitrate (33-0-0) at 100- 150 kg/ha by early September promotes the growth of ryegrass in the fall.

Seed production

Seed production by Westerwolds ryegrasses in the year of seeding is possible in the Maritime Provinces. In PEI several cultivars of Westerwolds ryegrass yielded more than 1000 kg/ha of seed. Seed production by Italian ryegrasses occurs in the year after seeding only in locations with very favorable conditions for overwintering. Detailed information on ryegrass seed production appears in "Agricultural Business Profile on Ryegrass Seed Production", Agdex 127/00, PEI Department of Agriculture and Forestry available at http://www2.gov.pe.ca/af/busprofile/ryegrass.asp

For seed production of annual ryegrasses, keep fields free of other grasses such as quackgrass (couch) and wild oats. Follow procedures for conventional seeding as outlined in section on "Stand establishment." For Westerwolds ryegrasses, apply a complete fertilizer (e.g., 17-17-17 at 300-400 kg/ha) before seeding. Then apply ammonium nitrate at 100-130 kg/ha at the three- to five-leaf stage. Phosphate and potash may be also required. Control broadleaf weeds by spraying with approved herbicides. The current requirements for seed certification (such as isolation, grade of seed to be sown, and inspection) are available from the Canadian Seed Growers' Association www.seedgrowers.ca/regulations/re1.html.

Seed of annual ryegrasses starts shedding at 43-45% seed moisture. It is, therefore important to monitor the seed moisture content carefully and start harvesting before severe shedding occurs. Annual ryegrasses are usually swathed at about 45% seed moisture and combined from the swath at 10-14 % seed moisture. Adjust the combine according to the manufacturer's recommendations. Dry ryegrass seed very carefully. Seed harvested at high moisture content is vulnerable to a rapid loss of germination from heating.

Recommendations for pesticide use in this publication are intended as guidelines only. Any application of pesticide must be in accordance with directions printed on the product label of that pesticide as prescribed under the Pest Control Products Act. **Always read the label**. Because recommendations for use may vary from province to province, consult your provincial agricultural representative and/or a local Certified Crop Advisor for specific advice.